Alberta Palæontological Society Bulletin

VOLUME 13 • NUMBER 1 MARCH 1998

ALBERTA PALAEONTOLOGICAL SOCIETY

The Society was incorporated in 1986, as a non-profit organization formed to:

a. Promote the science of palaeontology through study and education.
b. Make contributions to the science by:
   1) discovery
   2) collection
   3) description
   4) education of the general public
   5) preservation of material for study and the future
c. Provide information and expertise to other collectors.
d. Work with professionals at museums and universities to add to the palaeontological collections of the province (preserve Alberta's heritage).

MEMBERSHIP: Any person with a sincere interest in palaeontology is eligible to present their application for membership in the Society. (Please enclose membership dues with your request for application.)

Single membership	$15.00 annually
Family or Institution	$20.00 annually

THE *BULLETIN* WILL BE PUBLISHED QUARTERLY: March, June, September and December.
Deadline for submitting material for publication is the 15th of the month prior to publication.

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UPCOMING APS MEETINGS

Meetings take place at **7:30** p.m., in Room **B108***,
Mount Royal College: 4825 Richard Way SW, Calgary, Alberta

Thursday, April 9—Dr. Phil Currie: "Theropod Dinosaurs and the Origin of Birds."
(*NOTE: April 9 meeting will be held in the Jenkins Theatre, Mount Royal College)
Friday, May 15, 1998—Vaclav and Mona Marsovsky: "Hunting Dinosaurs in Argentina."
June, July, August, 1998—No meetings: see field trip announcements in March & June *Bulletin*

ON THE COVER: The pachycephalosaur dinosaur *Stygimoloch spinifer*. Art by APS member Cory Gross.

President's Message

by Wayne Braunberger

Spring is almost here as I write this in mid-February and at this time I look forward to the summer field trips. To date we have one confirmed trip in June to Grassy Mountain near Blairmore, in southern Alberta. Trips for July and August have not yet been determined and any ideas would be appreciated. One of the problems in organizing field trips is to find sites that are accessible to all. Over the years we have gone to most of the "easy" sites within a reasonable distance of Calgary. As such many of our trips are now two days long so that we may travel to sites that are a considerable distance away. To continue with the summer field trip program in its present form may not be possible. Any ideas or comments on how we could improve or change the program would be appreciated.

Spring is also election time and candidates for most positions would be welcome. I would like to welcome **Geoff Barrett** to the board. Geoff has volunteered to take on the position of Membership Director. Many of you may remember that Geoff was the first editor of the *Bulletin*. **Les Adler** is still doing double duty as Past President and Treasurer. A volunteer for the Treasurer's position would be appreciated.

On April 9 **Dr. Phil Currie** will be our guest speaker. This is a special presentation co-hosted by the Society and the Department of Geological Sciences at Mount Royal College. We would like to have this talk well attended, so **please let your friends and neighbors know about it.** ❑

READ THIS!

Dr. Phil Currie

of the
Royal Tyrrell Museum of Palaeontology
will speak to
the Alberta Palaeontological Society

Thursday, April 9, 1998 at 7:30 pm

in the **Jenkins Theatre**, Mount Royal College.

This special presentation takes the place of our regular April meeting.
There will be NO meeting on Friday, April 17.

1998 Field Trips

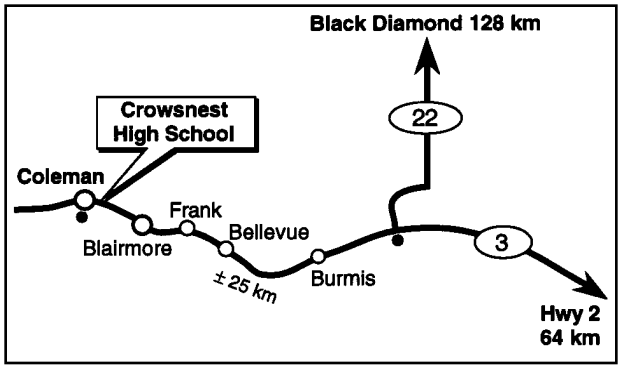
Field Trip 98-1: Saturday, June 20
Crowsnest Pass Area (southwestern Alberta)

This trip is planned as a one day field trip but if there is interest a second day can be added.

Meeting Place: meet at 10:00AM in the parking lot of the Crowsnest Consolidated High School, which is located on the north side of Highway 3 between Blairmore and Coleman (it is just on the eastern outskirts of Coleman). Allow 2.5 hours to drive from Calgary.

The day will be spent at Grassy Mountain, site of an abandoned strip mine, where Late Jurassic and Early Cretaceous plant and invertebrate fossils may be found. Terrestrial environments representing this period of time are not prolific in Alberta so this trip should be of interest to all plant collectors.

A somewhat strenuous two-hour hike (climbing 450 vertical metres) along the old mine access road is required to reach the prime locations. At the top are wonderful views of Crowsnest Mountain, the Seven Sisters, and the Flathead Range, so the effort is well rewarded. Those planning on attending should be physically fit and prepared for a full day in the field. ❑



Seminars

At press time tentative plans are in place for some short seminars starting in late March or early April. The proposed starting date is March 26 and extending into April and early May depending on topics and interest. Seminars will be held on Thursday evenings at the Geological Survey of Canada in northwest Calgary. Suggested topics are fossil identification, geology and fossils, and anatomy. More information will be available at the March 20 general meeting or call Wayne Braunberger at 278-5154. ❑

Program Summary

by Howard Allen

January 16, 1998
"Round-robin" workshop and poster session

Five APS members—Mrs. Roslyn Osztian, Mr. Cory Gross, Mr. Ron Fortier, Mr. Keith Mychaluk and Mr. Mike Skrepnick—did an outstanding job not only in their presentations but also in their preparation material. On behalf of the APS, I would like to extend my sincere thanks to the presenters. Also highlighting this year's presentation, by the courtesy of Dr. Terry Poulton, Chief Palaeontologist at the Geological Survey of Canada, Calgary, were a number of posters on GSC scientists' recent work on invertebrate palaeontology, made available to the APS workshop. The APS would like to thank Dr. Terry Poulton, Dr. Art Sweet (who was in attendance) and the GSC for their participation.

– Kris Vasudevan

Roslyn Osztian: ***Plant fossils of the Horseshoe Canyon Formation***

Roslyn displayed a number of plant fossils she has collected, along with photographs and slides of other plant specimens, both fossil and modern.

Four types of plant fossils are common in the Upper Cretaceous (Maastrichtian) Horseshoe Canyon Formation: *Sequoiadendron* is a fossil version of the *Sequoia,* the biggest modern tree on Earth, which is now restricted to northern California. Leaves and cones of *Sequoiadendron* are often confused with another genus, *Metasequoia,* whose status in the Horseshoe Canyon Formation is apparently controversial.

Equisitites is a name given to fossils of the horsetail, or scouring rush, *Equisetum*. Stems of this plant are occasionally found.

Ginkgo, or maidenhair tree is represented in the formation by the familiar fan-shaped, parallel-veined leaves, and by small, nut-like seeds.

Nilssonia is a type of cycad—the pineapple-shaped plants with short, stocky "trunks" and long fronds familiar to anyone who has seen dinosaur paintings. Leaves, cones (female cones, but strangely no male cones have been found) and the "corms" or rhizomes (underground stems) occur in the Horseshoe Canyon Formation.

Other, less common plant fossils include ferns and leaves of dicotyledonous (broad-leaved, flowering) plants similar to *Alnus* (alder).

Cory Gross: ***Palaeoecology of the Red Deer River badlands***

Cory had an assortment of fossils and pen-and-ink art pieces showing the range of organisms that coexisted in the Late Cretaceous of Alberta. Specimens of gar fish (*Lepisosteus* sp.) scales, turtle shell and crocodile remains were accompanied by illustrations of gar fish, turtles, oysters, rays (*Myledaphus bipartitus*), champsosaurs, dinosaurs and insects, showing how all these organisms occupied the ancient environment and interacted with one another. The Late Cretaceous environment that these organisms lived in was similar to the modern environment of the southeastern United States. Cory provided a good, multi-page handout summarizing the contents of his presentation.

Keith Mychaluk: ***The Yogo sapphire locality, Montana, USA***

Bucking the palaeontological trend, Keith presented a display concerning the topic of his undergraduate geology thesis, a sapphire occurrence in the neighbouring state of Montana.

The Yogo deposit, first discovered by prospectors in 1895, has been worked by a number of different operators over the years, and has produced millions of carats of sapphires.

The Yogo sapphires, a good number of which Keith had on display, range from almost white to intense blue, with some other anomalous colours occurring as well.

In his study, Keith worked out the process by which the sapphires were formed and emplaced into their matrix rock. The gems are found in a series of dikes—thin sheets of igneous rock (lamprophyre) injected vertically from a deep magma pool into the overlying "country rock." It appears that the hot magma penetrated an unknown, underground formation containing crude (non-gem-quality) corundum (aluminum oxide, the raw material of sapphires and rubies). Large crystals of raw corundum were carried upward in the dike magma, where they were heated, partially melting the corundum down, but also altering it to the clear blue colour prized in gems.

Ron Fortier: ***Fossil hunting in Horseshoe Canyon***

The highlight of Ron's presentation was an astonishingly accurate diorama depicting a bottom-to-top section of the Horseshoe Canyon badlands. The diorama was flagged with a number of typical exposure types where Ron has had success in finding fossils: oyster beds, depressions, rills, small al-

luvial fans etc., where fossils are often concentrated by ancient depositional and modern erosional processes. He also showed how a hand-held G.P.S. receiver can be useful in mapping fossil localities.

By displaying a wide range of fossils, from oysters and clams to plants, theropod teeth, ornithomimid bones, fish scales and bones, and turtle shell fragments, Ron proved that even an area like Horseshoe Canyon, long considered to be "picked-over," can be productive. The key is to use good observation techniques, and learn to recognize subtle landforms and signs that point to the spots where fossils are more likely to found.

Mike Skrepnick: ***Dinosaur restoration— an Artist's perspective***

Mike is a well-known professional artist who specializes in dinosaur paintings and reconstructions. His work has appeared everywhere, from coffee-table books and magazines, to T-shirts, to the *New York Times*.

One of Mike's latest projects has been working with Dr. Phil Currie in reconstructing the recently found "feathered dinosaur" *Sinosauropteryx prima* from the Lower Cretaceous of China.

He showed how an artist can incrementally reconstruct a fully-fleshed dinosaur from little more than a mess of squashed bones on a slab of rock. Detailed examination of the actual fossils by Dr. Currie have prompted Mike to revise his interpretation of the living animal.

Mike displayed several incarnations of his reconstruction—including the latest, completed only hours before our presentation:

• An initial restoration was drawn for the Chinese media, based on a first glance at a photo of the fossil. At first, it appeared that the "feathers" were only present along the animal's back—this version appeared in the *New York Times*.

• After an examination of the fossil by Dr. Currie in the spring of 1997, Mike expanded the "feathers" to most of the animal's body, and lengthened the tail. This restoration was used for the cover of the recently published *Dinosaur Encyclopedia.*

• Mike later sketched the actual fossil arrangement for a scientific article.

• Finally, giving us all a new-found respect for pencil crayons, Mike showed his latest version, a three-part restoration depicting the skeleton, musculature and skin covering. In making the restoration, he referred to literature on related animals (e.g. *Compsognathus* sp.) as well as work by Romer on tyrannosaurids, and bird anatomy books.

February 20, 1998
A Review of the Evolutionary History and Diversity of the Vertebrates, Part 3: Chondrichthyes (the Cartilaginous Fishes), with Dr. Gerry Morgan

Gerry presented the third in his series of excellent annual talks on vertebrate evolution, this year discussing the cartilaginous fishes—sharks, skates, rays and their kin.

The oldest fossil evidence of the class Chondrichthyes dates from the Late Devonian Period. Members of the class share a number of characteristics:

• Absence of bone—the internal skeleton is entirely cartilaginous; an external skeleton consisting of small, placoid scales (dermal denticles) and some spines is usually present.

• Males have pelvic claspers to aid in internal fertilization of the females.

• Females produce few, large-yolked eggs.

• No air bladders or lungs.

• The gills open separately to the exterior; there is no bony flap (operculum) covering the gills.

• The intestine has a spiral valve.

• The group is almost exclusively marine.

Chondrichthyans are rarely found as complete fossils, due to the poor preservability of cartilage. In some groups, cartilage may become secondarily calcified, allowing a few bones, such as vertebrae to be preserved. For the most part, sharks and their kin are known from their teeth, spines and scales. Teeth and dermal denticles are similar in structure; in fact, shark teeth may be modified denticles. The tiny, regularly-arranged denticles cover the skin and are very hard (like the teeth)—in the 19th Century, shark skin was used by cabinetmakers as a type of high-quality sandpaper.

Gerry described the characteristics of all the main groups of cartilaginous fishes, both living and extinct. The main surviving group, called the neoselachians, includes the modern sharks and rays. They underwent a rapid diversification in the Jurassic and Cretaceous and have since changed relatively little. Some notable neoselachians include the Miocene monster *Carcharodon megalodon,* estimated to be up to 24 m long, with teeth up to 15 cm. in length. Skates and rays are specialized for bottom-feeding, being dorso-ventrally flattened, with eyes on top and very wide pectoral fins. Their teeth are flattened, shell-crushing buttons arranged in a pavement on the upper and lower jaws.

Les Adler brought along a number of chondrichthyan fossils to illustrate Gerry's talk. ❑

Dinosaurs South of the 49th Parallel

by Vaclav Marsovsky

Dr. Dale A. Russell at the Royal Tyrrell Museum of Palaeontology, December 14, 1997.

Dr. Russell is one of the leading authorities on dinosaurs and on palaeoecology. He was curator of fossil vertebrates at the Museum of Nature in Ottawa for nearly 30 years, but now works as a college professor at North Carolina State University and is also the curator of the North Carolina Museum.

His talk focused on the interpretation of the environment that may have existed in the Carolinas during the Mesozoic with some comparison to palaeoenvironments of Alberta and to environments that exist in the Carolinas today. He also speculated about what kind of dinosaurs may have lived there.

Dr. Russell started his presentation by showing about 20 slides of the swamps that exist in the state of North Carolina. Local vegetation today includes bald cypress and pine. A couple of feet of elevation makes a lot of difference in the kind of vegetation you find. He made the analogy that this was the kind of environment around the Drumheller area during the Late Cretaceous.

Dinosaur remains in North Carolina are few and far between. One problem is the near lack of exposures. Only a few individual bones and bone fragments have been found. There are problems with identification of fragmentary material.

Dr. Russell then described the geology and geography of the Carolinas through time. During Early Permian time, the Appalachian area was more mountainous than it is today. The mountains may have been 3300 m (11,000 ft) high and probably were glaciated. During the Triassic, the mountainous environment persisted; there is evidence of high elevation valley deposition. The Mid-Atlantic ridge had not yet developed. Drainage was to the west across the Mississippi Valley and into what is now Texas and the Pacific. A lot of sediment was removed from these mountains and deposited to the west. During the Late Jurassic and Early Cretaceous, the highland area moved westward. By the middle of the Cretaceous, the direction of sedimentation reversed and went toward the east.

The plant record and leaf fossil sequences in North Carolina are very rich compared to dinosaur remains. The vegetation was different from the vegetation in Alberta during the same period. In North Carolina the vegetation was more heat stressed. The fossil record indicates that the mean summer temperature in North Carolina would have been 27°C and in winter 23°C during the Cretaceous. Now the mean winter temperature is a much cooler 10°C. It was suggested that the tropical storms and hurricanes batter the Carolinas today may have battered the seashores of Alberta during the Cretaceous. The tropical storms would have come up the interior seaway from the Gulf of Mexico.

The Middle Jurassic dinosaur record is missing from North America. In Africa, Middle Jurassic dinosaurs have been found. One such group found in Africa were the large sauropods. If the theory that Africa was in contact with North America during the Jurassic is correct then it can be extrapolated that these same kinds of dinosaurs inhabited North Carolina The large sauropods indicate that gigantism was achieved early in dinosaur evolution.

An *Acrocanthosaurus* specimen has recently been purchased by the North Carolina Museum and will be on display in the new museum in 1999. It is similar in size to *T. rex* but it has tall spines along the back. This high-spined theropod is from the Early Cretaceous (90 Ma) of Oklahoma. Only limited remains have been found and the jury is still out on whether this animal has a relationship with African dinosaurs. The brain case looks different from that of *T. rex*. Palaeontologists like Dr. Russell are trying to assess whether *Acrocanthosaurus* has affinities with theropods in the western half of North America or with those of Africa and the southern continents. No tyrannosaurid specimens have ever been found on the eastern seaboard. *Dryptosaurus*, "tearing lizard," an intriguing meat-eater found in New Jersey in the last century is not a tyrannosaurid. *Dryptosaurus* teeth serrations look like those of another dinosaur from Africa.

Dr. Russell continues to look for links between dinosaurs of the eastern US and those of Africa. He believes the links are there to be found. ❑

Check our web page!

www.geocities.com/SoHo/9094/aps.html

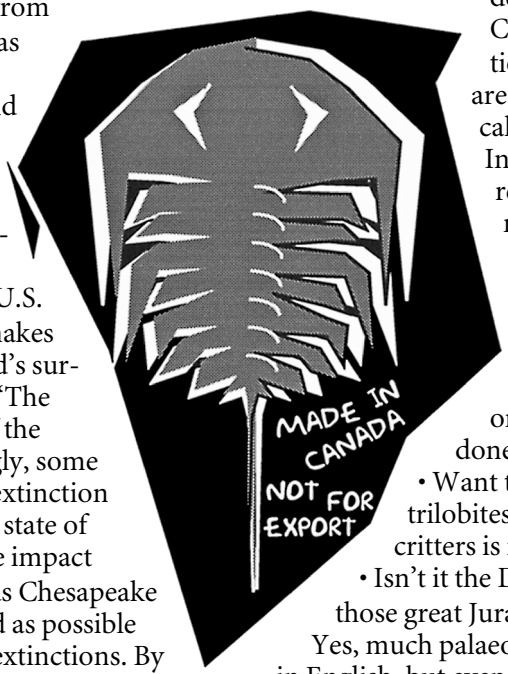
Fossils Don't Carry Passports

by Joseph LeBlanc

At the age of eight I was astounded when I first learned that the Soviet Union and Canada were the world's largest (in area) countries. *Not* the United States?

"Why," I asked my older and wiser brother, "is it that in the movies flying saucers always land in the United States? Do aliens always speak not only English, but American English? How come aliens don't land in Siberia, the Gobi of China, or in the middle of the Pacific Ocean? Surely the United States must cover most of the world!"

Fast forward a few decades to the '90s. Dinosaur extinction theory, via evidence from the Chixclub crater, is every bit as puzzling as the science of my beloved space movies. Where did the comet that wiped out the dinos hit? No, not quite so blatant as to be the United States, but of course, dramatic flood evidence of the Chixclub impact site is supposedly found on the U.S. Gulf Coast. The United States makes up only two percent of the world's surface area. What are the odds of "The Hit" being within the vicinity of the United States? More astoundingly, some U.S. geologists once linked the extinction to an impact crater found in the state of Iowa. Stretching it further, some impact craters found in the U.S. (such as Chesapeake Bay) have recently been targeted as possible impact sites for alleged Eocene extinctions. By golly, the United States sure is geologically important to the world!



No, the dinosaurs were not wiped out by a space bolide hitting the Earth, "just south of the United States." I'll let others continue to pursue the arguments. **I will, however, emphasize the need for both amateurs and professionals to "get outside" the bounds of cultural and geographic limitations when pursuing fossil evidence.** There is an absolute necessity for a universal approach to palaeontology. The world is BIG. Our individual geographic regions are only fragments of a larger palaeontological puzzle.

The need for a universal approach to fossils is made evident to me as I currently participate in a research project on Permian rugose corals. Luckily, corals are not as romantic as dinosaurs, so science—and not regionalism—prevails. One of my tasks is to verify information found in over 90 palaeontological articles. These articles are from a multitude of sources and are printed in eight different languages. I can handle the English, and my second language is French. The Russian was a struggle (but I did manage, having had a year's study of this language). The German is decipherable. My Polish is hopeless and I don't even know "which way is up" in the Chinese publications (…or was that Japanese?). Thank heaven the systematic taxonomy is in universal Latin. Easy or hard, however, all references must be qualitatively researched.

The point is that our Permian coral research would not be valid without recognizing the "borderless" nature of science. Continental drift, faunal migrations, mountain building, etc. are impervious to modern political or cultural limitations. International literature must be researched and translations made. Examples:

- The Russians have published much more on Carboniferous faunas than have North Americans.
- Much of pre-1940s research on Mesozoic ammonites was done in German, not English.
- Want to identify your Moroccan trilobites? The definitive work on these critters is in French.
- Isn't it the Danes who publish about all those great Jurassic faunas from Greenland?

Yes, much palaeontological work is published in English, but even much of this research is found within obscure regional studies dating back many decades.

The value of researching existing publications was made clear to me on a recent collecting trip to some Carboniferous exposures in Clark County, Nevada. The exquisitely preserved corals I found at one site have not been studied. They are, however, identical in sequence to those of the Mount Head Formation of Alberta. Using literature on Mount Head corals, I could identify genera as I moved through time, up the rock exposures, from Lower Carboniferous toward the Upper Carboniferous

boundary. The site in Nevada is of the same palaeo-faunal province as the one in Alberta, 2000 kilometres to the north. Unlike the familiar corals, the brachiopods I found at the Nevada site had me baffled. A seasoned palaeontologist referred me to some Russian literature…Eureka! The same brachiopod assemblage is illustrated in a Russian publication. The faunal province extends from Nevada through the Rockies of Alberta, across the Arctic Ocean and into northern Russia. Yes, I used Canadian and Russian publications to help identify Nevada fossils!

Of course we all pursue those fossils found in our own part of the world. To study these fossils, however, it is vital to look beyond our own familiar palaeo publications. Tracking down useful fossil research requires the same enthusiastic energy we apply to finding the actual fossils themselves.

Maybe, in the movies, flying saucers were landing in other parts of the world. What if I had been watching Japanese or Russian movies? Maybe all aliens didn't speak English…how do you say "Take me to your leader" in Chinese?

In the next Bulletin*, Joe will provide some information on what publications are available to help the palaeontologist "dig into fossils."* ❑

APS Budget for 1998

by Les Adler, acting Treasurer

Revenues		***Expenditures***	
Memberships	$1300	Bank charges	$60
Raffle revenues	80	Coffee expenses	120
Pin sales	12	P.O. box rental	72
Coffee receipts	70	Field trip expenses	60
U.S. exchange	40	Printing	1,000
		Postage	30
		Jour. subscription	160
	$1,502		$1,502

As at the end of January 1998, the bank account held approximately $2,250. Bills not paid (for 1997, not yet presented): $450. Bills owing for February & March, 1998: approximately $400. Projected bank balance for March 31, 1998: $1,400.

Want to save the Society some money, and be a little more "green" at the same time? How about bringing your own, reusable coffee mug to the next meeting?

Fossils in the News

Calgary Herald, December 13, 1997

Ancient pond on Ellesmere Island reveals glimpse of forest life millions of years ago

OTTAWA—Palaeontologist Richard Harington of the Canadian Museum of Nature has spent the last six summers excavating the rich remains of a tiny pond on the bleak landscape of Ellesmere Island in Canada's high arctic. The pond sediments reveal that the area was much warmer than today, as little as 3.5 million years ago. At that time the climate supported a mixed boreal forest and grassland environment. Nowadays, the nearest trees are 1,900 km to the south. Fossils of beaver, bear, deer, horses, rabbits and carnivores of the weasel family have been recovered. Plant material includes wood so well preserved that "…you can bend the twigs. You can see the precise, cutting-tooth marks scored into the wood (by beaver)." So far, Harington has had time to examine only the larger specimens. Yet to be studied are smaller items including rabbit droppings, insects and molluscs.

Calgary Herald, January 15, 1998

Feathered dinosaur theory takes flight

CALGARY—Dr. Philip Currie is the first western palaeontologist to have studied the recently-discovered fossil of *Protoarchaeopteryx,* a 125 million-year-old dinosaur displaying what Currie says are "unquestionable" feathers. The presence of feathers supports the theory that birds evolved directly from feathered dinosaurs.

Currie was shown examining the fossil—during a recent trip to China—on a Discovery Channel documentary, *If Dinosaurs Could Fly*. In the program, Currie tells Dr. Ji Qiang, director of the Chinese Geology Museum in Beijing, that the controversial skin structures "look like good feathers to me…unbelievable!"

On the same visit, Dr. Currie also made the first examination of both halves (part and counterpart) of another "feathered dinosaur" of the same age, *Sinosauropteryx,* concluding that it had "prototype feathers" along its back and sides.

Calgary Herald, January 31, 1998

Seas rise and fall as axis of Earth migrates

OTTAWA—University of Toronto physicists Dr. Jerry Mitrovica and his grad student Jon Mound have been studying the wobble of the Earth's axis

and conclude that a large-scale, long-period component of the wobble may be responsible for worldwide changes in sea level. In an article in the journal *Science,* Mitrovica and Mound contend that the Earth's axis varies in position by as much as 3000 km over tens of millions of years, causing sea levels to rise or fall by as much as 100 metres. Major changes in sea level have long been recognized in the geological record. In the Late Cretaceous Period, much of North America was inundated by shallow seas.

According to the theory, the shifting axis is accompanied by a shift in the equatorial bulge of the spinning Earth. The shift in the bulge causes sea-level to rise in some areas and fall in others. Major sea-level shifts have previously been attributed to plate tectonic movements. Mitrovica says the pair were "shocked" by the simple, one-to-one relationship between axis migration and sea level change as recorded in the rocks.

Calgary Herald, January 31, 1998

Paleontologist scours Carpathians for evidence of Transylvania dinosaurs—where small is beautiful

BALTIMORE—The long-ignored remains of Romanian dinosaurs, originally studied early this century by palaeontologist Baron Franz Nopsca, have lured the highly-regarded American dinosaur palaeontologist Dr. David Weishampel to eastern Europe's Carpathian mountains.

The Romanian dinosaurs, which include duckbills (hadrosaurs), armoured dinosaurs and theropods, are unique in being considerably smaller than most of their contemporaries from other parts of the world. A well-documented phenomenon of dwarfism occurs when large animals become isolated on island ecosystems over many generations. More recent examples include miniature mammoths and hippos found on islands some distance from mainland populations.

70 million years ago, the Carpathians were part of such an island, in an archipelago that stretched from Spain to Azerbaijan. Weishampel has studied a Romanian version of *Velociraptor* that was only about a metre in length, and hadrosaurs (his specialty) only four metres long. Weishampel believes that the hadrosaurs' dentition, consisting of batteries of tiny, efficient, plant-chewing teeth first developed in this dwarf population, then spread to Asia and North America after the Carpathian island became reconnected to the Eurasian mainland.

Edmonton Journal, March 1, 1998

Flower origins carry scent of mystery

BOSTON—One of the biggest mysteries in palaeobotany has been the origin of angiosperms —the flowering plants. Today's most common plants cover much of the Earth and are pretty much taken for granted, but questions such as "how old are they?", "why are they so diverse?" and "how did they come to dominate the Earth's plant life?" continue to pose problems.

In the past decade some spectacular finds from around the world have helped to shed light on some of these questions. Earlier studies failed to produce hard evidence of flowering plants older than about 95 million years; but starting in the mid-80s, carbonized fossils of tiny herbaceous angiosperms, including flower parts, were found in Europe and the United States, extending the record back to 120 million years. Molecular biologists, clocking DNA mutation rates, estimate that the angiosperms may have originated about 200 million years ago.

It now appears that the first angiosperms were tiny, weedy herbs rather than the woody magnolia-like plants originally thought to be the earliest representatives of the group. These "weeds" resemble members of the pepper family, and probably carpeted forest floors. The small plants may have been good at spreading rapidly over areas damaged by forest fires or other environmental changes, and evolved rapidly as they spread into different geographical areas.

The new fossils that have helped shed light on the angiosperms' origins have been found in mudstones and preserve fine detail. The amount of material will keep researchers busy for years; according to one worker, Patrick Herendeen, of George Washington University, "there's more material than we can possibly work on."

Calgary Herald, March 6, 1998

Fossils of new dinosaur discovered

BUENOS AIRES (AP)—In this brief item, Argentine palaeontologist Dr. Jorge Calvo of the University of Comahue announces the discovery of a new type of carnivorous dinosaur. The fossils of the 5.5-metre-tall theropod, from the rich beds (Upper Cretaceous) at Rincon de los Sauces, 1,225 km southwest of Buenos Aires, include "…vertebrae, a shoulder blade and leg bones, all in excellent condition," according to Calvo. "We've never seen pieces like these."

Thanks to Les Adler, Brian Allen, Trudy Martin, Roslyn Osztian and Sam Richter for clippings. ❑

Frayed Scales become Feathers: Discussion

by Howard Allen

Frayed Scales become Feathers by Sam Richter, APS *Bulletin*, December 1997, p. 11–14.

This feature article was a good review of the rightly discredited concept of "Lamarckian evolution," or "soft inheritance" and tells a fascinating story of how political misuse of a faulty theory resulted in tragic consequences.

I think, however, that the author is mistaken in believing that respected modern scientific writers have slipped into a Lamarckian mode of thought when they suggest that bird feathers evolved from "frayed scales."

Our hero, the rancher Vern Johnson has made a semantic error in assuming that the word *frayed* necessarily means "tattered or separated into fibres, *due to friction*." This is, of course, the meaning of the word in its usage as the past-tense of the **verb** "to fray." ("She *frayed* the hem of her dress by letting it drag on the ground.")

But *frayed* can also be applied as an **adjective**, meaning simply "having a ragged or fibrous edge," *which does not necessarily imply frictional wear.*

For example, Webster's dictionary (1981) includes the following definitions of the verb *fray:* "…to separate the strands or threads at the edge or end of (as a piece of fabric or rope); also: to divide an end or edge of, so that the separate divisions fan out." and "to thin or separate into shreds, parts or separate units, and spread or splay." Note that these definitions do not specify frictional wear.

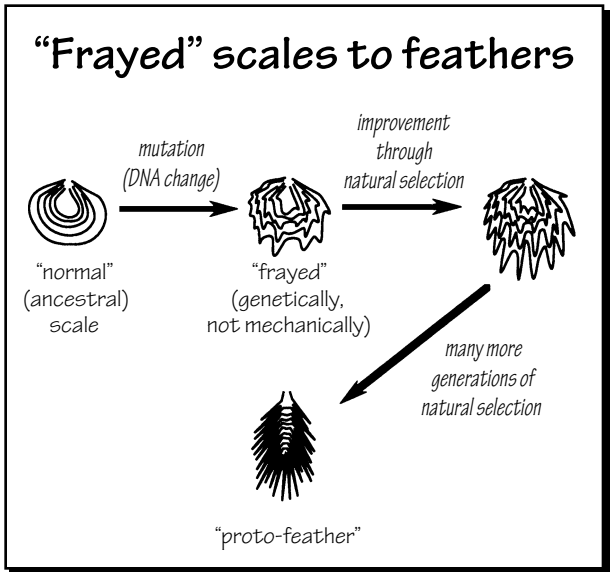
This, I am confident, is the meaning that Ernst Mayr, Richard Dawkins and other authors have used in suggesting that "frayed scales became feathers." The statement could be reworded: "fibrous-edged scales became feathers."

We can state that (for example) the petals of some flowers are "frayed," simply as a descriptive term, without implying that fresh flowers have been subject to frictional abuse. (For instance, the Australian fringed lily, *Thysanotus* sp.; Zahl, 1976.) Likewise, to say that a shell or bone has a "bevelled" edge doesn't have to imply that the shell was subject to any mechanical cutting or abrasion to bring the edge to a taper—it just grew that way.

How, then, did "frayed scales become feathers" in the context of Dawkins and others? How can this idea be reconciled with the one-way-street of modern genetics, or "hard inheritance," which demands the rule "DNA to RNA to body protein, never the reverse"?

I don't claim to have studied in detail (or even casually) the structure and evolution of bird feathers, or to have more than a cursory knowledge of molecular genetics, but from my reading of Dawkins and other writers on evolution and general biology (e.g. Curtis, 1968), this is how I would envisage the evolution of feathers from scales:

First, if we presume that the chromosomes of scaled animals have a gene that either codes directly for scale shape, or indirectly influences scale shape, we can understand that a mutation in that gene might result in an offspring that has (instead of normal, smoothly curved or angled scale edges) scale edges that might be rough, jagged or fibrous. Mutations are caused by accidental changes in the sequence of nucleotide building blocks of the DNA molecules that determine the form and function of an organism. That's the DNA step.



RNA molecules are like subsets of the DNA double-helix molecule. The RNA nucleotide building-block sequence is thus a direct match to the DNA molecule's sequence, the DNA molecule acting as a mould, or template, for the construction of RNA. Any changes (mutations) on the DNA molecule are thus copied to the RNA. There's the RNA step.

Now, RNA molecules build protein molecules by assembling amino acid units into sequences that are coded directly by subsequences of the RNA molecule's own structure. Here's how mutations in the DNA molecule ultimately result in changes in

the DNA molecule ultimately result in changes in body protein. So we now have the sequence "DNA to RNA to body protein."

Getting back to the scales, we can see that a mutation in a parent's gene for scale shape might affect the shape of its offspring's scales. Jagged or fibrous-edged scales, by fortuitously trapping more air against the body, might, in the right circumstances (cool nights or seasons) impart a small advantage to an animal that is otherwise unharmed by the mutation. The animal with "frayed" (*i.e.* fibrous-edged) scales might be able to forage longer for food in cool conditions than its smooth-scaled siblings. The fibrous-scaled animal might, through better nutrition, or quicker response to danger in cool conditions, become relatively fitter than the rest, and pass its genes on to later generations. If a short-fibred scale offers a tiny advantage, longer fibres might give even more advantage in cool conditions. Thus it's not inconceivable that a "selection pressure" toward more-fibrous scales could develop over many generations, eventually resulting in very long and/or deeply divided fibres (feathers).

This incremental change through selected advantage is the very concept Dawkins tries to get across with his metaphor of "climbing Mount Improbable."

If Dawkins, Mayr and others are guilty of anything, they are guilty only of being careless in allowing their casual remarks about "frayed scales" to be misinterpreted by some readers.

All scientists, being human beings, are of course embedded in a matrix of human culture, "human nature," and history, and as such are subject to unconscious biases and philosophical inertia, as Mr. Richter suggests. But in this case of "frayed scales to feathers," I would judge Drs. Dawkins and Mayr definitely "not guilty" of backsliding into the mire of Lamarckian evolution. ❑

References:

Curtis, H. 1968. *Biology*, second edition. Worth Publishers, Inc., New York, p. 250–255.

Dawkins, R. 1996. *Climbing Mount Improbable*. W.W. Norton & Co., New York. p. 124.

Merriam, G.C. & Co. (publ.) 1981. Webster's Third International Dictionary.

Zahl, P.A. 1976. *Southwest Australia's wild gardens: bizarre and beautiful.* National Geographic, V. 150, No. 6, Dec. 1976, p. 866.

Reviews

by Les Adler

The Origin of Birds and their Flight
by Kevin Padian and Luis M. Chiappe
Scientific American, February 1998, p. 38-47.

If you read palaeontological articles at all, then this one is your number-one priority for 1998.

Dr. Kevin Padian is professor of integrative biology and curator in the Museum of Paleontology at the University of California, Berkeley, and is the president of the National Center for Science Education. With Dr. Phil Currie, he is co-editor of the Encyclopedia of Dinosaurs (1997). Dr. Luis Chiappe is a researcher at the American Museum of Natural History and professor at the City University of New York.

Over the past twenty years new fossil discoveries and new research methods have enabled palaeontologists to determine that birds have descended from ground-dwelling, meat-eating dinosaurs of the group known as theropods and to work out how the earliest birds took to the air.

Charles Darwin's theory of evolution by natural selection appeared in print in 1859. In 1860 and 1861 the first two specimens of *Archaeopteryx lithographica*, possibly the oldest known member of the birds, dating from about 150 million years ago, was found in Bavaria.

In 1870 Harry Seeley contested Thomas Huxley's assertion of kinship between theropods and birds despite 35 common features that did not occur together in any other animal. In 1916 Gerhard Heilmann published *The Origin of Birds*. However, there was a problem that theropods apparently lacked clavicles, the two collarbones that are fused into a wishbone in birds. In 1924 a published drawing of *Oviraptor* clearly showed a wishbone but it was misidentified. After 1935 clavicles were found in a broad spectrum of the theropods related to birds.

During the 1970s John Ostrom published a series of papers about *Archaeopteryx*, *Deinonychus* and other theropods, concluding that birds are directly descended from small theropod dinosaurs. The use of cladistics has strongly validated Ostrom's conclusions.

It is difficult to appreciate the diagrams on pages 40 and 41 without prior knowledge or experience in handling bird bones and their names, obtainable by examining a chicken. One cladogram

matches skeletons and silhouettes, dividing the dinosaur/bird lineage into a number of related groups, or clades, based on shared characters:

1) Theropoda —development of three functional toes and hollow bones (*Coelophysis*).

2) Tetanurae—a 3-fingered hand (*Allosaurus*).

3) Maniraptora—half-moon shaped wrist bone (*Velociraptor*).

4) Early birds—claw curving toward the others (*Archaeopteryx*).

5) Later birds—fingers fused together; the simple tail becomes a pygostyle composed of fused vertebrae; the back toe dropped, enabling the birds to firmly grasp tree limbs.

Some of the developments are shown in a set of sketches.

Bones of Contention

Some scientists remain unconvinced by the proposed lineages, but they do not present any alternative theory by cladistics or any other method that objectively analyses relationships among animals. Padian and Chiappe discuss a number of controversial points:

a) They describe differences in 3-fingered and 5-fingered hands, distinguishing between avian and non-avian theropods.

b) Theropods seem to appear too late to give rise to birds. Several "missing-link" fossils of Jurassic age now appear to have been found.

c) The wishbone of birds is not like the clavicles in theropods. Again, the missing bones now appear to have been found.

d) The complex lungs of birds could not have evolved from theropod lungs. Not settled either way as of 1998.

About 1977 Jacques A. Gauthier did an extensive cladistic analysis of birds, dinosaurs and their reptilian relatives. Today's cladogram shows that the clade labelled Aves (birds) consists of the ancestor of *Archaeopteryx* and all other descendants of that ancestor. This clade is a subgroup of tetanuran theropods which descended from basal theropods which evolved from non-theropod dinosaurs. This shows that birds are dinosaurs and reptiles.

Details are presented which show that features traditionally considered "birdlike" actually appeared before the advent of birds, in their preavian theropod ancestors. The immediate reptilian ancestor of dinosaurs was bipedal, upright, small, carnivorous, its hands were free for grasping, the ankle joint became hinge-like and the foot bones were elongated. The changes in the feet gave speed which later on would help avian theropods to fly. Hollow bones and skull cavities and long necks lightened the skeleton. Fossils show that habits once thought birdlike originated in non-avian dinosaurs—such as laying patterns and protection of eggs. The discovery of *Sinosauropteryx* (a dinosaur apparently covered in feather-like structures) suggests that feathers might have predated the emergence of birds. A second creature, *Protoarchaeopteryx*, seems to have true feathers on its body and longer feathers attached to the tail and is a maniraptoran theropod. A number of important fossils have been uncovered since 1990, with fossil bird finds from China, Spain, Mongolia, Madagascar and Argentina.

Final statement and notes:

Living birds are nothing less than small, feathered, short-tailed theropod dinosaurs. Six references are cited including the *Encyclopedia of Dinosaurs*, and books by Chatterjee and Feduccia.

APS member Dr. Phil Currie is involved in major studies of the above materials and is supported by a Calgary-based non-profit agency, the Dinosaur Research Institute.

Uncovering Patagonia's Lost World by James Shreeve. *National Geographic*, December 1997, p. 120–137.

This article is another spectacular contribution to the magazine's series on dinosaurs, this time from Southern Argentina, over a 1,600 kilometre stretch of country east of the Andes, with discoveries coming from each of the major Mesozoic geological periods: Triassic, Jurassic and Cretaceous. Pages 126 and 127 show 22 fossil sites and paintings of six dinosaurs and a possible bird, each from a different clade. Each of the last several years has seen the discovery of at least one new species, providing more material for the new museums appearing in this region.

Conventional theory is based on bones mainly found in North America and Asia. Researchers consider the dinosaurs from Patagonia as aberrations—but palaeontologist Rodolfo Corio claims that the South American dinosaurs are the "normal" groups and that it is the North American and Asian forms that are the bizarre types.

Giganotosaurus of a size similar to *T. rex,* but 25 million years older and related to *Carcharodontosaurus* of Africa comes from this area.

The El Chocon area, about 800 miles southeast of Buenos Aires, bills itself as the "Valley of the Dinosaurs." Sauropods range in age from Jurassic to Late Cretaceous. *Argentinosaurus* took seven years to excavate and appears to be the largest di-

nosaur known. This region has also produced two excellent titanosaur sauropod skulls, previously unknown. A 90-million year old megaraptor about eight times the size of *Velociraptor* is known from a stupendous claw. *Patagonykus* is close to *Mononykus,* which appears to be a bird.

The many new forms will help in the understanding of dinosaur and bird evolution overall.

Flapping through the Bottleneck by Rosemary Sullivant. *Earth*, December 1997, p. 22, 23.

This article presents arguments between theorists who study fossil birds. Alan Cooper of Oxford University and David Penney of Massey University, New Zealand have studied DNA sequences in modern birds and claim that twenty-two lineages of these existed well before the K/T extinction. S. Blair Hedges of Pennsylvania arrived at a similar timetable for several birds and most mammals. A difficulty exists because small hollow-boned birds are rarely fossilized. Alan Feduccia questions these conclusions. Paul Sereno of Chicago expects that new fossil bird finds will reinforce the molecular evidence that many birds survived the K/T extinction. The colourful accompanying diagram is too simplified.

Horns of Plenty by James Kirkland. *Earth*, December 1997, p. 26–31.

Dinamation International Society has a travelling exhibit called "Ceratopsia: The Life and Times of the Horned Dinosaurs" touring the United States. Each skull is matched with a complete model.

Ceratopsian bodies were similar, but the heads are decked with all kinds of combinations of horns, hooks, studs and spurs. Ceratopsians lived and died in vast herds, leaving behind bone beds with thousands of pieces which have to be cleaned, sorted and matched by palaeontologists. A recently found specimen in Arizona, about 92 million years old shows that brow horns evolved before double-rooted teeth. Here are a few notes on eight ceratopsians in the exhibit:

1) *Centrosaurus* model by Greg Wenzel. This is the classic centrosaur with hundreds of bones having been collected in Dinosaur Provincial Park, Alberta by palaeontologists from the Royal Tyrrell Museum. Apparently a herd drowned while crossing a river and scavengers feasted on the remains. Centrosaurs probably reached adulthood in three to five years.

2) *Monoclonius* skull from the Canadian Museum of Nature, Ottawa. A confused situation exists because palaeontologists do not agree on the animal's sex, or whether it is an adult.

3) *Avaceratops* model by Mike Jones. The skull is a composite from two specimens with brow horns. The genus may disappear from textbooks with more finds.

4) *Brachyceratops*, model by Mike Jones. From several partial skeletons, mostly juveniles.

5) *Styracosaurus* had the largest nasal horn of any known ceratopsian and also six huge spikes sprouting from its frill and many other spurs. It can be traced for ten million years through the fossil record.

6) *Einiosaurus*, 72 million years old, model by Greg Wentzel.

7) *Achelosaurus*, 70 million years old, model by Tim Barry. These two ceratopsians were found in Montana in 1995 and provide missing links between *Styracosaurus* and *Pachyrhinosaurus.*

8) *Pachyrhinosaurus*, model by Dan LoRusso. Many well-preserved fossils show that this was the biggest centrosaur, the last to die out and with the greatest distribution. Horns seen in young specimens disappeared in adulthood.

Tracking a Dinosaur Attack by David A. Thomas and James O. Farlow. *Scientific American*, December 1997, p. 74–79.

Thomas is a sculptor of dinosaurs and studies animal gaits and tracks to make his models technically accurate. Farlow is professor of geology at Indiana Purdue University at Fort Wayne, researching dinosaur footprints and the biology of U.S. ice-age mammals.

This article is accompanied by a large painting, photographs of tracks and a reconstructed sequence showing an attack of a carnivorous dinosaur on a herbivorous dinosaur with the relevant tracks from the Paluxy River trackway in Texas.

Roland T. Bird discovered this set of tracks in 1938 and partially excavated them in 1940 and mapped and photographed the tracks thoroughly. The results were mislaid but reemerged many years later. Farlow studied these tracks in 1987.

It seems that Bird was not only lucky enough to find remarkable evidence of this incident of natural history but that he was also wise enough to recognize, document and excavate part of the record of this ancient hunt left on a sodden plain, now turned to stone. ❑

Another great APS T-shirt by Mike Skrepnick is in the works…see the next Bulletin for details!

Coming Events

April 9, Thursday, 7:30 PM

Alberta Palaeontological Society and Mount Royal College

Present an evening lecture by

Dr. Philip Currie

Royal Tyrrell Museum of Palaeontology:

"Theropod Dinosaurs and the Origin of Birds"

Jenkins Theatre, Mount Royal College, Calgary
Free Admission

April 5 to 9, 1998

Dr. Hugh Torrens Lecture Series

Dr. Hugh Torrens is Reader in Geology at Keele University, U.K. His initial work was on Mesozoic ammonoids, and he is well known among specialists for his contributions to a standard zonation for the Bathonian stage, a particularly challenging time interval because of inter-basinal faunal provincialism. His most recent contributions have been wide-ranging in the areas of history and technology, and his insights into the history of vertebrate paleontology will be of particular interest. [*Thanks to Dr. Terry Poulton, GSC –ed.*]

The following lectures are scheduled for these dates and localities:

April 5, Sunday, 2:00 PM
Royal Tyrrell Museum, Drumheller
Museum Auditorium (free lecture)
"The Extraordinary History of Dinosaurs"

April 7, Tuesday, evening*
University of Calgary*
"The Extraordinary History of Dinosaurs"

April 8, Wednesday, noon*
University of Calgary*
"Mary Anning of Lyme Regis: a Woman Pioneer in Palaeontology"

*Note: at press time, no times or locations for the University of Calgary lectures were available; contact the Department of Geology & Geophysics: (403) 220-5841

April 9, Thursday, evening*
Edmonton Geological Society*
"The Extraordinary History of Dinosaurs"
*Info: Dr. Brian Chatterton, U of A (403)492-3983

May 2, Saturday, 10 AM – 7 PM
May 3, Sunday, 10 AM – 5 PM

Calgary Rock and Lapidary Club

38th Annual Gem, Mineral & Fossil Show: "A Hobby for All Ages"

Displays, silent auction, door prizes, fish pond, dealers, demonstrations.

West Hillhurst Arena, 1940 - 6 Ave NW, Calgary
(extra parking at Queen Elizabeth High School)

Admission: Adults $3.00
Seniors/Youth (7–17 years) $2.00
Under 6 free with accompanying adult

Info: Chairman (403)288-5249
Publicity (403)287-1570.

June 12 – 14, 1998

Billings Gem and Mineral Club

Journey into the Past: Northwest Federation of Mineralogical Societies Regional Show

Special Guests: **Dr. Philip Currie, Dr. Robert Bakker** together in a panel discussion. Two special meteorite displays, dinosaurs and fossils "beyond all your expectations."

- Full skeleton of *Monolophosaurus jiangi* (Jurassic, China), 20 ft. long, 10 ft. tall.
- Full skull of *Triceratops* from Wyoming.
- Skeleton of a juvenile raptor from South Dakota.
- Possibly the world's most complete skull of *Camarasaurus*.
- *Protoceratops* skeleton from Montana
- Special display of paleo art by John Standly of New York.
- Precious metal (gold) and lapidary displays.
- Field trips and lots more.

Metra Park, Montana Pavilion, Billings, MT

Camping and motel accommodations available in Billings. Please register prior to April 26, 1998.

For information, registration forms, etc., contact Doug True: 2622 Broadwater Ave., Billings, MT, 59102. Phone (406) 656-5707 evenings. ❑